

**WE CLAIM:**

1. An absorbent article comprising a wearer contacting surface and a garment contacting surface, a topsheet providing a wearer contacting surface, a breathable barrier backsheet providing a garment contacting surface, and an absorbent core located in between said topsheet and said backsheet, at least one of said topsheet, said backsheet or said absorbent core including at least one layer of a macroscopically apertured film, said macroscopically apertured film comprising:
  - i. a first surface;
  - 10 ii. a second surface that is spaced apart from said first surface; and
  - iii. a plurality of perforations extending through said film, each perforation forming a capillary defined by a sidewall that extends from said first surface to an aperture located in said second surface, said 15 capillary being disposed at an elevation angle with respect to a plane that is parallel to said first surface, said capillaries being disposed at multiple elevation angles.
2. An absorbent article of claim 1 where the capillary is disposed at a surface angle.
- 20 3. An absorbent article of claim 1, wherein the sidewall extends from said first surface to an aperture located in said second surface at the apex of the capillary.
4. An absorbent article comprising a wearer contacting surface and a garment contacting surface, a topsheet providing a wearer contacting surface, a breathable barrier backsheet providing a garment contacting surface, and an absorbent core located in between said topsheet and said backsheet, at least one of said topsheet, said backsheet or said

absorbent core including at least one layer of a macroscopically apertured film, said macroscopically apertured film comprising:

- i. a first surface;
- ii. a second surface that is spaced apart from said

5 first surface; and

iii. a plurality of perforations extending through said film, each perforation forming a capillary defined by a sidewall that extends from said first surface to an aperture located in said second surface, said capillaries being disposed at multiple surface angles.

10 5. An absorbent article comprising a wearer contacting

surface and a garment contacting surface, a topsheet providing a wearer contacting surface, a breathable barrier backsheet providing a garment contacting surface, and an absorbent core located in between said topsheet and said backsheet, at least one of said topsheet, said backsheet or said

15 absorbent core including at least one layer of a macroscopically apertured film, said macroscopically apertured film comprising:

- i. a first surface;
- ii. a second surface that is spaced apart from said

first surface; and

20 iii. a plurality of perforations extending through said film, each perforation forming a capillary defined by a sidewall that extends from said first surface to an aperture located in said second surface, said capillary having a water vapor permeability, said capillaries exhibiting a multiplicity of water vapor permeabilities.

25 6. An absorbent article of claim 5, wherein the multiplicity of water vapor permeabilities is obtained by providing at least a first capillary and a second capillary, each capillary including a first opening in the first surface, the surface area of the first opening of said first capillary being different than the surface area of the first opening of said second capillary.

7. An absorbent article of claim 5, wherein the multiplicity of water vapor permeability is obtained by providing at least a first capillary and a second capillary, each capillary, including a second opening in the second surface, the surface area of the second opening of said first capillary being 5 different than the surface area of the second opening of said second capillary.

8. An absorbent article of claim 5, wherein the multiplicity of water vapor permeability is obtained by providing at least a first capillary and a second capillary, the shape of said first capillary being different than the shape of said second capillary.

10 9. An absorbent article of claim 5, wherein the multiplicity of water vapor permeability is obtained by providing at least a first capillary and a second capillary, the length of said first capillary being different than the length of said second capillary.

15 10. An absorbent article of claim 5, wherein the multiplicity of water vapor permeability is obtained by providing at least a first capillary and a second capillary, the surface texture of inner wall of said first capillary being different than the surface texture of inner wall of said second capillary.

11. An absorbent article comprising a wearer contacting surface and a garment contacting surface, a topsheet providing a wearer 20 contacting surface, a breathable barrier backsheet providing a garment contacting surface, and an absorbent core located in between said topsheet and said backsheet, at least one of said topsheet, said backsheet or said absorbent core including at least one layer of a macroscopically apertured film, said macroscopically apertured film comprising:

- 25 i. a first surface;  
ii. a second surface that is spaced apart from said first surface; and  
iii. a plurality of perforations extending through said film, each perforation forming a capillary defined by a sidewall that extends

from said first surface to an aperture located in said second surface, said capillaries exhibiting a multiplicity of levels of compression resistance.

12. An absorbent article of claim 11, wherein the multiplicity of levels of compression resistance is obtained by providing at least a first 5 capillary comprising a first opening placed in the first surface of the film, and a second capillary comprising a first opening placed in the first surface of the film, the surface area of the first opening of said first capillary being different than the surface area of the first opening of said second capillary.

13. An absorbent article of claim 11, wherein the multiplicity 10 of levels of compression resistance is obtained by providing at least a first capillary comprising a second opening in the second surface of the film, and a second capillary comprising a second opening in the second surface of the film, the surface area of the second opening of said first capillary being different than the surface area of the second opening of said second capillary.

15 14. An absorbent article of claim 11, wherein the multiplicity of levels of compression resistance is obtained by providing at least a first capillary and a second capillary, the shape of said first capillary being different than the shape of said second capillary.

15. An absorbent article of claim 11, wherein the multiplicity 20 of levels of compression resistance is obtained by providing at least a first capillary and a second capillary, the length of said first capillary being different than the length of said second capillary.

16. An absorbent article of claim 11, wherein the multiplicity 25 of levels of compression resistance is obtained by providing at least a first capillary and a second capillary, the distance between the first surface of the film and the second surface of the film defined by the sidewall of said first capillary being different than the distance between the first surface and the second surface defined by the sidewall of said second capillary.

17. An absorbent article of claim 11, wherein the multiplicity of levels of compression resistance is obtained by providing at least a first capillary and a second capillary, an elevation angle of said first capillary being different than an elevation angle of said second capillary.

5           18. An absorbent article comprising a wearer contacting surface and a garment contacting surface, a topsheet providing the wearer contacting surface; a breathable barrier backsheet providing the garment contacting surface, and an absorbent core located in between said topsheet and said backsheet, at least one of said topsheet, said backsheet or said  
10 absorbent core including at least one layer of an apertured film, said apertured film comprising:

- i. a first surface;
- ii. a second surface that is spaced apart from said first surface; and

15           iii. a plurality of apertured capillaries extending through said film, between said first surface and said second surface, each capillary defined by a side wall that extends from said first surface to said second surface, each capillary having an elevation angle,  
said film comprising at least a first type of apertured capillaries and a  
20 second type of apertured capillaries, the first type of apertured capillaries having a different elevation angle than the second type of apertured capillaries.

19. An absorbent article of claim 18, wherein substantially all apertured capillaries in the first type of apertured capillaries have substantially  
25 the same elevation angle.

20. An absorbent article of claim 18, wherein substantially all apertured capillaries in the second type of apertured capillaries have substantially the same elevation angle.

21. An absorbent article of claim 18, wherein said backsheet includes said film.

22. An absorbent article of claim 18, wherein said film is a macroscopically apertured polymer film.

5           23. An absorbent article of claim 18, which further includes a distribution layer placed between said topsheet and said absorbent core, said distribution layer being in fluid communication with said topsheet and said absorbent core, the distribution layer including at least one layer of the apertured film.

10           24. An absorbent article comprising a wearer contacting surface and a garment contacting surface, a topsheet providing the wearer contacting surface, a breathable barrier backsheet providing the garment contacting surface, and an absorbent core located in between said topsheet and said backsheet, at least one of said topsheet, said backsheet or said

15           absorbent core including at least one layer of an apertured film, said apertured film comprising:

- i. a first surface;
- ii. a second surface that is spaced apart from said

first surface; and

20           iii. a plurality of apertured capillaries extending through said film between said first surface and said second surface, each capillary defined by a sidewall that extends from said second surface to said first surface,

25           said film comprising at least a first type of apertured capillaries and a second type of apertured capillaries, the first type of apertured capillaries having a different surface angle than the second type of apertured capillaries.

25. An absorbent article of claim 24, wherein substantially all capillaries in the first type of apertured capillaries have substantially the same surface angle.

26. An absorbent article of claim 24 wherein substantially all capillaries in the second type of apertured capillaries have substantially the same surface angle.

27. An absorbent article of claim 24, wherein said backsheet  
5 includes said film.

28. An absorbent article of claim 20 wherein said film is a macroscopically expanded apertured polymer film.

29. An absorbent article of claim 24, which further includes a distribution layer placed between said topsheet and said absorbent core, said  
10 distribution layer being in fluid communication with said topsheet and said absorbent core.

30. An absorbent article comprising a wearer contacting surface and a garment contacting surface, a topsheet providing the wearer contacting surface, a breathable barrier backsheet providing the garment  
15 contacting surface, and an absorbent core located in between said topsheet and said backsheet, at least one of said topsheet, said backsheet or said absorbent core including at least one layer of an apertured film, said apertured film comprising:

i. a first surface;  
20 ii. a second surface that is spaced apart from said first surface; and  
iii. a plurality of apertured capillaries extending through said film between said first surface and said second surface, each capillary defined by a sidewall that extends from said second surface to said  
25 first surface,

said film comprising at least a first type of apertured capillaries and a second type of apertured capillaries, the first type of apertured capillaries having a different water vapor permeability than the second type of apertured capillaries.

31. An absorbent article of claim 30, wherein the different water vapor permeability is obtained by providing a different surface area of a first opening placed in the first surface of the film of said first type of apertured capillaries, than in the first opening, placed in the first surface of said film, of 5 the second type of apertured capillaries.

32. An absorbent article of claim 30, wherein the different water vapor permeability is obtained by providing a different surface area of a second opening, placed in the second surface of said film, of said first type of apertured capillaries than in a second opening, placed in the second surface 10 of said film, of the second type of apertured capillaries.

33. An absorbent article of claim 30, wherein the different water vapor permeability is obtained by providing the first type of apertured capillaries having a different shape than the second type of apertured capillaries.

15 34. An absorbent article of claim 30, wherein the different water vapor permeability is obtained by providing the first type of apertured capillaries having a different length than the second type of apertured capillaries.

20 35. An absorbent article of claim 30, wherein the different water vapor permeability is obtained by providing the first type of apertured capillaries having a different surface texture of their inner walls than the second type of apertured capillaries.

36. An absorbent article of claim 30 wherein the backsheet includes said film.

25 37. An absorbent article of claim 30 wherein said film is a macroscopically apertured polymer film.

38. An absorbent article of claim 30, which further includes a distribution layer placed between said topsheet and said absorbent core, said distribution layer being in fluid communication with said topsheet and said absorbent core, the distribution layer including at least one layer of the  
5 apertured film.

39. An absorbent article comprising a wearer contacting surface and a garment contacting surface, a topsheet providing the wearer contacting surface, a breathable barrier backsheet providing the garment contacting surface, and an absorbent core located in between said topsheet  
10 and said backsheet, at least one of said topsheet, said backsheet or said absorbent core including at least one layer of an apertured film, said apertured film comprising:

- i. a first surface;
  - ii. a second surface that is spaced apart from said  
15 first surface; and
  - iii. a plurality, of apertured capillaries extending through said film between said first surface and said second surface, each capillary defined by a sidewall that extends from said second surface to said first surface,
- 20 said film comprising at least a first type of apertured capillaries and a second type of apertured capillaries, the first type of apertured capillaries having a different level of compression resistance than the second type of apertured capillaries.

40. An absorbent article of claim 39 wherein the different  
25 level of compression resistance is obtained by providing a different surface area of a first opening, placed in the first surface of said film, in the first type of apertured capillaries than in a first opening, placed in the first surface of said film, of the second type of apertured capillaries.

41. An absorbent article of claim 39 wherein the different  
30 level of compression resistance is obtained by providing a different surface

area of a second opening, placed in the second surface of said film, in the first type of apertured capillaries than in a second opening, placed in the second surface of said film, in the second type of apertured capillaries.

42. An absorbent article of claim 39, wherein the different  
5 level of compression resistance is obtained by providing a different shape to  
said first type of capillaries than to said second type of capillaries.

43. An absorbent article of claim 39, wherein the different  
level of compression resistance is obtained by providing a different length to  
said first type of capillaries than to said second type of capillaries.

10 44. An absorbent article of claim 39, wherein the different  
level of compression resistance is obtained by providing a different distance  
between the first surface of the film and the second surface of the film in the  
first type of apertured capillaries than in the second type of apertured  
capillaries.

15 45. An absorbent article of claim 11, wherein the different  
level of compression resistance is obtained by providing a different elevation  
angle to said first type of apertured capillaries than to said second type of  
apertured capillaries.

46. An absorbent article of claim 39 wherein said backsheet  
20 includes said film.

47. An absorbent article of claim 39 wherein said film is a  
macroscopically expanded apertured polymer film.

48. An absorbent article of claim 39 which further includes a  
distribution layer placed between said topsheet and said absorbent core, said  
25 distribution layer being in fluid communication with said topsheet and said  
absorbent core, the distribution layer including at least one layer of the  
apertured film.

49. A macroscopically apertured film comprising:
- i. a first surface;
  - ii. a second surface that is spaced apart from said first surface; and
  - 5 iii. a plurality of perforations extending through said film, each perforation forming a capillary defined by a sidewall that extends from said first surface to an aperture located in said second surface, said capillary being disposed at an elevation angle with respect to a plane that is parallel to said first surface, said capillaries being disposed at multiple elevation angles.
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50. A macroscopically apertured film comprising:
- i. a first surface;
  - ii. a second surface that is spaced apart from said - first surface; and
  - 15 iii. a plurality of perforations extending through said film, each perforation forming a capillary defined by a sidewall that extends from said first surface to an aperture located in said second surface, said capillaries being disposed at multiple surface angles.
- 20
51. A macroscopically apertured film comprising:
- i. a first surface;
  - ii. a second surface that is spaced apart from said first surface; and
  - 25 iii. a plurality of perforations extending through said film, each perforation forming a capillary defined by a sidewall that extends from said first surface to an aperture located in said second surface, said capillary having a water vapor permeability, said capillaries exhibiting a multiplicity of water vapor permeabilities.
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52. A film of claim 51, wherein the multiplicity of water vapor permeabilities is obtained by providing at least a first capillary and a second capillary, each capillary including a first opening in the first surface, the

surface area of the first opening of said first capillary being different than the surface area of the first opening of said second capillary.

53. A film of claim 51, wherein the multiplicity of water vapor permeability is obtained by providing at least a first capillary and a second 5 capillary, each capillary including a second opening in the second surface, the surface area of the second opening of said first capillary being different than the surface area of the second opening of said second capillary.

54. A film of claim 51, wherein the multiplicity of water vapor permeability is obtained by providing at least a first capillary and a second 10 capillary, the shape of said first capillary being different than the shape of said second capillary.

55. A film of claim 51, wherein the multiplicity of water vapor permeability is obtained by providing at least a first capillary and a second capillary, the length of said first capillary being different than the length of said 15 second capillary.

56. A film of claim 51, wherein the multiplicity of water vapor permeability is obtained by providing at least a first capillary and a second capillary, the surface texture of inner wall of said first capillary being different than the surface texture of inner wall of said second capillary.

20 57. A macroscopically apertured film comprising:  
i. a first surface;  
ii. a second surface that is spaced apart from said  
first surface; and  
iii. a plurality of perforations extending through said  
25 film, each perforation forming a capillary defined by a sidewall that extends  
from said first surface to an aperture located in said second surface, said  
capillaries exhibiting a multiplicity of levels of compression resistance.

58. A film of claim 57, wherein the multiplicity of levels of compression resistance is obtained by providing at least a first capillary comprising a first opening placed in the first surface of the film, and a second capillary comprising a first opening placed in the first surface of the film, the 5 surface area of the first opening of said first capillary being different than the surface area of the first opening of said second capillary.

59. A film of claim 57, wherein the multiplicity of levels of compression resistance is obtained by providing at least a first capillary comprising a second opening in the second surface of the film, and a second 10 capillary comprising a second opening in the second surface of the film, the surface area of the second opening of said first capillary being different than the surface area of the second opening of said second capillary.

60. A film of claim 57, wherein the multiplicity of levels of compression resistance is obtained by providing at least a first capillary and a 15 second capillary, the shape of said first capillary being different than the shape of said second capillary.

61. A film of claim 57, wherein the multiplicity of levels of compression resistance is obtained by providing at least a first capillary and a second capillary, the length of said first capillary being different than the 20 length of said second capillary.

62. A film of claim 57, wherein the multiplicity of levels of compression resistance is obtained by providing at least a first capillary and a second capillary, the distance between the first surface of the film and the second surface of the film defined by the sidewall of said first capillary being 25 different than the distance between the first surface and the second surface defined by the sidewall of said second capillary.

63. A film of claim 57, wherein the multiplicity of levels of compression resistance is obtained by providing at least a first capillary and a

second capillary, an elevation angle of said first capillary being different than an elevation angle of said second capillary.

64. A film comprising:

- 5 a) a first surface;
- b) a second surface which is spaced from the first

surface;

c) a plurality of apertured capillaries extending between the first surface and the second surface, each capillary having an elevation angle and a surface angle;

10 the film comprising at least a first type and a second type of apertured capillaries, the first type of apertured capillaries having a different elevation angle than the second type of apertured capillaries.

15 65. A film of claim 64, wherein the first type of apertured capillaries has a different surface angle than the second type of apertured capillaries.

66. A film of claim 64, wherein the first type of apertured capillaries has a different vapor permeability than the second type of apertured capillaries.

20 67. A film of claim 64, wherein the first type of capillaries has a different surface area of a 1st opening than the second type of capillaries.

68. A film of claim 64, wherein the first type of capillaries has a different surface area of a 2nd opening than the second type of capillaries.

69. A film of claim 64, wherein the first type of capillaries has a different shape than the second type of capillaries.

25 70. A film of claim 64, wherein the first type of capillaries has a different length than the second type of capillaries.

71. A film of claim 64, wherein surface texture of an inner wall of the first type of capillaries is different than surface texture of an inner wall of the second type of capillaries.

72. A film comprising:
- 5           a) a first surface;
- b) a second surface which is spaced from the first surface;
- c) a plurality of apertured capillaries extending between the first surface and the second surface, each capillary having a compression resistance;
- 10           the film comprising at least a first type of apertured capillaries and a second type of apertured capillaries, the first type of apertured capillaries having a different type of compression resistance than the second type of apertured capillaries.

15           73. A film of claim 72, wherein the surface area of a 1st opening of the first type of capillaries is different than the surface area of a 1st opening of the second set of capillaries. .

20           74. A film of claim 72, wherein surface area of a 2nd opening of the first set of capillaries is different than surface area of a 2nd opening of the second set of capillaries.

75. A film of claim 72, wherein the shape of the first set of capillaries is different than the shape of the second set of capillaries.

76. A film of claim 72, wherein the length of the capillaries of the first type is different than the length of the capillaries of the second type.

25           77. A film of claim 72, wherein the distance between the first surface and the second surface of the first type of capillaries is different than

the distance between the first surface and the second surface of the second type of capillaries.

78. A film of claim 72, wherein elevation angle of the first type of capillaries is different than elevation angle of the second type of capillaries.

5 79. A film of claim 72, wherein surface angle of the first type of capillaries is different than surface angle of the second type of capillaries.

10 80. An article of claim 1, wherein the film is made from a mixture of at least about 10% wt. of medium density polyethylene and the remainder low density polyethylene, linear low density polyethylene or a blend of low density polyethylene and linear low density polyethylene.

81. An article of claim 1, wherein the film is made from a mixture of at least about 10% wt. of high density polyethylene and the remainder low density polyethylene, linear low density polyethylene or a blend of low density polyethylene and linear low density polyethylene.

15 82. A film of claim 51 which is made from a mixture of at least about 10% wt. of medium density polyethylene and the remainder low density polyethylene, linear low density polyethylene or a blend of low density polyethylene and linear low density polyethylene.

20 83. A film of claim 51 which is made from a mixture of at least about 10% wt. of high density polyethylene and the remainder low density polyethylene, linear low density polyethylene or a blend of low density polyethylene and linear low density polyethylene.

25 84. A film of claim 81 whose resistance to leakage under pressure is substantially the same when the film is unwound from a roll or wound onto a roll.

85. An absorbent article comprising a wearer contacting surface and a garment contacting surface, a topsheet providing a wearer contacting surface, a breathable barrier backsheet providing a garment contacting surface, and an absorbent core located in between said topsheet and said backsheet, at least one of said topsheet, said backsheet or said absorbent core including at least one layer of a macroscopically apertured film made from a mixture of at least about 10% wt. of MDPE or HDPE and the remainder LDPE, LLDPE or a mixture of LDPE and LLDPE, said macroscopically apertured film comprising:
- 10           i.     a first surface;
- ii.    a second surface that is spaced apart from said first surface; and
- iii.    a plurality of perforations extending through said film, each perforation forming a capillary defined by a sidewall that extends from
- 15           said first surface to an aperture located in said second surface, said capillary being disposed at an elevation angle with respect to a plane that is parallel to said first surface.

86. An article of claim 85 wherein the film has substantially the same leakage under pressure when it is unwound from a roll as when it is wound on a roll.

87. An article of claim 83 wherein all capillaries have substantially the same elevation angles.

88. A macroscopically apertured film comprising:

25           i.     a first surface;

              ii.    a second surface that is spaced apart from said first surface; and

              iii.    a plurality of perforations extending through said film, each perforation forming a capillary defined by a sidewall that extends from said first surface to an aperture located in said second surface, said

30           capillary being disposed at an elevation angle with respect to a plane that is

parallel to said first surface, said film made from a mixture of at least about 10% wt. of HDPE or MDPE and the remainder LDPE, LLDPE or a mixture of LDPE and LLDPE.

89. A film of claim 88 wherein all capillaries have  
5 substantially the same elevation angles.

90. A film of claim 88 whose resistance to leakage under pressure is substantially the same when the film is unwound from a roll or wound onto a roll.

91. A film of claim 88 wherein the capillaries are disposed at  
10 multiple elevation angles.

92. A film of claim 88, wherein all capillaries have substantially the same elevation angles.

93. A film of claim 88 wherein the capillaries are disposed at multiple elevation angles.

15 94. A screen for use in making an apertured film, comprising:  
a) a first surface;  
b) a second surface spaced from the first surface;  
c) a plurality of passageways in a first zone of the screen, the passageways extending between the first surface and the second  
20 surface; and  
d) a plurality of passageways in a second zone of the screen, the passageways extending between the first surface and the second surface, wherein the plurality of passageways in the first zone is configured to produce apertures having different characteristics than  
25 apertures produced by the plurality of passageways in the second zone.

95. A screen of claim 94, wherein the surface area of a 1st opening of at least one of the plurality of passageways in the first zone is

different than the surface area of a 1st opening of at least one of the plurality of passageways in the second zone.

96. A screen of claim 94, wherein the surface area of a 2nd opening of at least one of the plurality of passageways in the first zone is different than surface area of a 2nd opening of at least one of the plurality of passageways in the second zone.  
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97. A screen of claim 94, wherein the shape of at least one of the plurality of passages in the first zone is different than the shape of at least one of the plurality of passages in the second zone.

10 98. A screen of claim 94, wherein the elevation angle of the at least one of the plurality of passageways in the first zone is different than elevation angle of at least one of the plurality of passageways in the second zone.

15 99. A screen of claim 94, wherein the surface angle of at least one of the plurality of passageways in the first zone is different than surface angle of at least one of the plurality of passageways in the second zone.

100. A method of forming capillaries in an unapertured film, comprising:

20 passing the unapertured film over a screen;  
with the screen, forming capillaries of a first slant angle in a portion of the film;  
with the screen, forming capillaries of a second slant angle in a portion of the film, wherein the first slant angle is different than the  
25 second slant angle.

101. A method according to claim 100 wherein forming capillaries of a second slant angle comprises forming capillaries of a second

slant angle with substantially the same elevation angle as the capillaries of the first slant angle.

102. A method according to claim 100 wherein forming capillaries of a second slant angle comprises forming capillaries of a second 5 slant angle with substantially the same surface angle as the capillaries of the first slant angle..

103. A method according to claim 100 wherein forming capillaries of a second slant angle comprises forming capillaries of a second slant angle that are of a different shape than capillaries of the first slant angle.

10 104. A method according to claim 100 wherein forming capillaries of a second slant angle comprises forming capillaries of a second slant angle that have a different diameter, as measured at a surface of the film, than capillaries of the first slant angle.

15 105. A method of hydroforming a three-dimensional formed film, comprising:

passing an unapertured film over a first screen, the first screen having a regulated pattern of passageways therein;

directing a first fluid flow onto the unapertured film to force the film to substantially conform to the regulated pattern of the first screen in a 20 first regulated zone;

passing the film over a second screen, the second screen having a regulated pattern of passageways therein;

directing a second fluid flow onto the film to force the film to substantially conform to the regulated pattern of the second screen in a 25 second regulated zone; and

wherein at least a portion of the first regulated zone is separate from the second regulated zone.

106. A method in accordance with claim 105 wherein at least a portion of the first regulated zone overlaps the second regulated zone.

107. A method in accordance with claim 106 wherein the first regulated pattern produces capillaries in the film that have a smaller diameter than capillaries produced by the second regulated pattern.  
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